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Description

Method for monitoring the position of a mobile communication terminal for location dependent telecommunication services and an active voice connection

Technical field of the invention

10 Location dependent telecommunication services (*Location Dependent Services*) are becoming more and more significant in mobile radio networks.
A known technology for implementing such and other telecommunication services in telecommunication networks, in particular in the mobile radio network, is the "Intelligent Network" IN, which is known to the person skilled in the art through ITU publications (Q.1200 ff) and ETSI standards.

20 For calls originating from a mobile terminal (*Mobile Originating Call*, MOC), only the location of the mobile terminal (*Mobile Station*, MS) when the connection is set up is currently assessed.
In this context, the location of the terminal can up to now be established in the manner below. The message IDP (*INAP Operation Initial DP*) to the service center contains a location information item (*LocationInformation*) which contains the number (*LocationNumber*) of that radio cell (*serving cell*) in a mobile radio network which is originally used to set up the call. If the service customer moves into another cell (handover), the service center (for example the SCP, Service Control Point) is given no kind of indication about the change of location.

35 The consequence for a service and, by way of example, its specific billing (*Home Zone Billing*, HZB), depending on the location, is as follows: if the

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service customer starts a telephone call within a
privileged radio cell (Home Zone), the

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call is billed at a cheaper rate. This situation also does not change if he leaves this radio cell (Home Zone), however. The service provider wants the service customer to telephone at a cheaper rate only within his 5 own radio cell(s) (Home Zone), but at the normal mobile radio tariffs outside this (these) radio cell(s).

The same applies for the opposite direction: if the 10 service customer starts a telephone call outside his Home Zone and enters his Home Zone during the call, then his telephone call is billed at the higher rate in his Home Zone too.

15 The same problem also arises when the customer using the location dependent service, which uses this billing model, for example, is called (Mobile Terminating Call, MTC) .

This concerns all the position-dependent 20 characteristics of a telecommunication service, for example including access authorizations to particular services, restrictions on service characteristics in particular radio cells, etc.

25 **Prior art**

Techniques for position finding are already known. Delay time measurements can be used to establish the 30 location of the mobile terminal with an accuracy of approximately 100 meters (*Time Of Arrival TOA, Enhanced Observed Time Difference E-OTD*). The use of a radio-assisted global positioning system (GPS) is also known.

Both solutions are complex and cost intensive. They 35 also provide much more accurate position details than are needed for the telecommunication services described.

It is an object of the invention to specify a method which permits sufficiently accurate position finding for a mobile terminal during a call and at the same time avoids the drawbacks cited above.

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Description of the invention

This object is achieved by a method in accordance with patent claim 1.

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In this context, an extension is described below for telecommunication services (MOC and MTC).

The feature fundamental to the invention is that the telecommunication service, which can be activated by the A-party (that is to say by the calling party, MOC) or by the B-party (that is to say by the called party, MTC), is location dependent. This may mean that it is subject to different billing models, or else that other service features (Features) differ depending on location.

To guarantee that the telecommunication service works correctly during a call, the position of the terminal in question needs to be checked not only when the connection is set up but also over the entire duration of the active connection. If a change of position is established, the telecommunication service then needs to be changed in a corresponding manner by the service center, that is to say a change to the billing model used, for example.

Once the telecommunication service becomes aware of the changes of position, the service center (for example the SCP in an IN) can then react to the change during the call - a service characteristic which has not been available to date.

The advantage over "Time Of Arrival" (TOA) and "Enhanced Observed Time Difference" (E-OTD) is that the technology available in the network is used. The solution presented in this case is simpler to 5 implement, even if it is not as accurate.

Advantageous refinements and developments are specified in the subclaims.

10 The inventive method is particularly advantageous when a special billing model is used in which the charges incurred are dependent on which subscriber is involved and what his current position is.

15 The change of position can, in principle, be initiated:
- via the terminal:

In one preferred embodiment, the terminal reports its position to the service center. This can be done whenever the terminal establishes a (significant) 20 change of position or else at regular intervals and also a combination of the two.

- via the service center:
In another embodiment, the position of the terminal is requested by the service center. This can be done 25 at regular intervals.

In this context, the position information item transmitted from the communication terminal to the service center may be in any format. If it is not in 30 the format used by the service center, the service center needs to convert it into suitable position information after reception.

The regularity and the intervals with/at which position 35 information is transmitted can be chosen as appropriate by the person skilled in the relevant art.

Brief description of the drawings

The invention is explained below using exemplary embodiments, where

5 figure 1 shows a schematic illustration of a mobile radio network of cellular design and a terminal whose position within the mobile radio network changes during a call,
10 figure 2 shows a solution variant initiated by the SCP, and
figure 3 shows a solution variant initiated by the terminal.

Description of the preferred embodiments

15 Figure 1 shows a mobile radio network of cellular design containing a few radio cells FZ1, FZ2, FZ3 and FZ4. Each radio cell contains apparatuses H-BSC, V-BSC, illustrated by triangles, which control the radio traffic for the cell in question. These apparatuses are connected to a central controller MSC which has access to subscriber registers HLR and VLR. These techniques are known to the person skilled in the art of GSM (Global System for Mobile Communication) technology,
20 but other cellular radio networks such as PCN (Personal Communication Network) or the like are also conceivable.
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30 A subscriber in this mobile radio network now uses his terminal MT (Mobile Terminal) to dial another subscriber number and thus obtains a connection to the network in his radio cell FZ1. The location of the second subscriber B-Party and his exchange M-SSP are not relevant to the inventive method.
35 This radio cell is linked to a particular characteristic in the service center. This may be a particular billing system referred to by the operator

as the Home Zone, and this connection is thus billed using a separate billing model.

If the subscriber now moves, leaves the Home Zone and enters the neighboring radio cell FZ3, the central controller is informed about this change of position, as shown in the two subsequent figures.

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The position is transmitted to the service center during the telephone call by means of additional *Unstructured Supplementary Service Data USSD* and SIM toolkit, for example. In this context, location information available in MT and/or location changes are transmitted. Parameters which are available are, by way of example, "Location Area Identity" (LAI), "Serving Cell ID" and "Serving Cell Channel".

10 15 Two solution variants can be envisaged:

• SCP initiates: Figure 2. The IN service logic in the service control center SCP asks at service-specific time intervals whether the telephoning subscriber A-

20 Party has moved (- this allows the service provider to keep the signaling load under control). To this end, the SCP sends the IN customer a request USSD Request (to the Calling Party Address CgPA in the case of MOC services, to the Called Party Address CdPA in the case of MTC services) which tells the SIM toolkit of the MS to respond with a USSD Response containing location information and/or location changes.

25 30 35 • MS initiates: Figure 3. In the event of handover, the MT uses the SIM toolkit to inform the service center SCP via USSD Request that it has moved. Even within an enclosed space, handover frequently occurs if an adjacent cell has a better signal strength; in this case, however, there has been no change of location relevant to the service provider. To prevent the SCP from being notified of an unnecessary amount of location changes as a result of this, a time

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controller can also be incorporated in the MT: the MS divulges the location information and/or location changes no earlier than after a settable

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time period, but immediately once this time period has elapsed.